

### **ABSTRACT OF THE DISCLOSURE**

A Time-Of-Flight mass spectrometer is configured with a pulsing region and electronic controls that generate a potential well for ions in the pulsing region, due to the repelling effect of a high-frequency electric field that is created in the space immediately proximate to a surface, and an additional static electric field that accelerates ions toward the surface. Ions can be constrained and accumulated over time in the potential well prior to acceleration into the Time-Of-Flight tube for mass analysis. Ions can also be directed to collide with the surface with high energy to cause Surface Induced Dissociation (SID) fragmentation, or with low energy to effect collisional cooling, hence, better spatial focusing, prior to mass analysis. The apparatus and methods described in the invention result in refined control of ion fragmentation energy and improved Time-Of-Flight mass analysis performance.